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This document is part of a collection that serves two purposes. First it is a public archive for data and documents resulting from evolutionary, ecological, and behavioral research conducted by the Ketterson-Nolan research group. The focus of the research is an abundant North American songbird, the dark-eyed junco, *Junco hyemalis*, and the primary sources of support have been the National Science Foundation and Indiana University. The research was conducted in collaboration with numerous colleagues and students, and the objective of this site is to preserve not only the published products of the research, but also to document the organization and people that led to the published findings. Second it is a repository for the works of Val Nolan Jr., who studied songbirds in addition to the junco: in particular the prairie warbler, *Dendroica discolor*. This site was originally compiled and organized by Eric Snajdr, Nicole Gerlach, and Ellen Ketterson.

Context Statement
This document was generated as part of a long-term biological research project on a songbird, the dark-eyed junco, conducted by the Ketterson/Nolan research group at Indiana University. For more information, please see IUScholarWorks (https://scholarworks.iu.edu/dspace/handle/2022/7911).

An estimation of female home-range size during the nestling period in Dark-eyed Juncos (*Junco hyemalis*)

Dustin G. Reichard and Ellen D. Ketterson

Indiana University, Bloomington, IN

ABSTRACT

The transition from eggs to nestlings marks a period of increased effort for female songbirds as individuals begin to forage for nestlings in addition to themselves and continue to devote a large amount of time to brooding. This increase in energetic expenditure during the early nestling period predicts an increase in female activity, but a decrease in female home-range size in comparison to the rest of the nesting cycle as females attempt to forage near the nest to minimize their energy loss. Using radio telemetry and GIS software, we estimated the home range size of seven female Dark-eyed Juncos (*Junco hyemalis*) three days after their nestlings had hatched. We attached radio transmitters using a leg-loop harness and tracked these females for two hours on the afternoon of day three of nestling life and two hours in both the morning and afternoon on days four and five. Female location and behavior was noted every ten minutes for the duration of the tracking. Home-range size was found to vary greatly between individuals, which may be attributable to differences in resource availability and the relative densities of conspecifics. As expected, female behavior was dominated by brooding and foraging, and in most cases females varied their foraging sites. Conspecific interactions outside the pair-bond were noted only three times throughout the duration of the study and all were agonistic. We will compare female home-range size during the nestling period to both male and female juncos at other periods in the nesting cycle and to other species based on data in the literature. Studies of home-ranges such as this provide unmatched insight into a species' resource management, time budget, and social interactions under free-living conditions.

INTRODUCTION

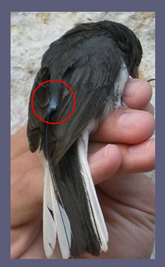
-Use of space by breeding birds differs by sex and stage of reproduction.[1]
-In general home-range size decreases across the nesting cycle.[1]
-Foraging near the nest may reduce locomotory costs but may also attract predators.
-In Dark-eyed Juncos, females brood the young, and both sexes feed nestlings.
-Extra-pair fertilizations are relatively common.
-Male juncos have larger home-ranges when their mates are fertile than when they have nestlings.[2,3]
-Female home-range size during female fertile period has been quantified, but other stages have not.

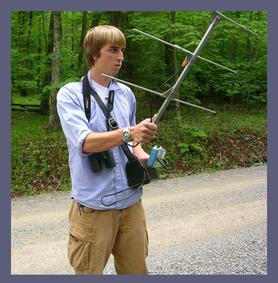
HYPOTHESES

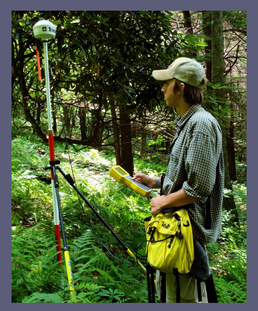
-Female home-ranges will be smaller with nestlings than when fertile owing to increased energetic expenditure associated with feeding and brooding nestlings.
-During the nestling period female home-ranges will be smaller than male home-ranges because males do not brood and achieve reproductive success through parental behavior and extra-pair behavior.

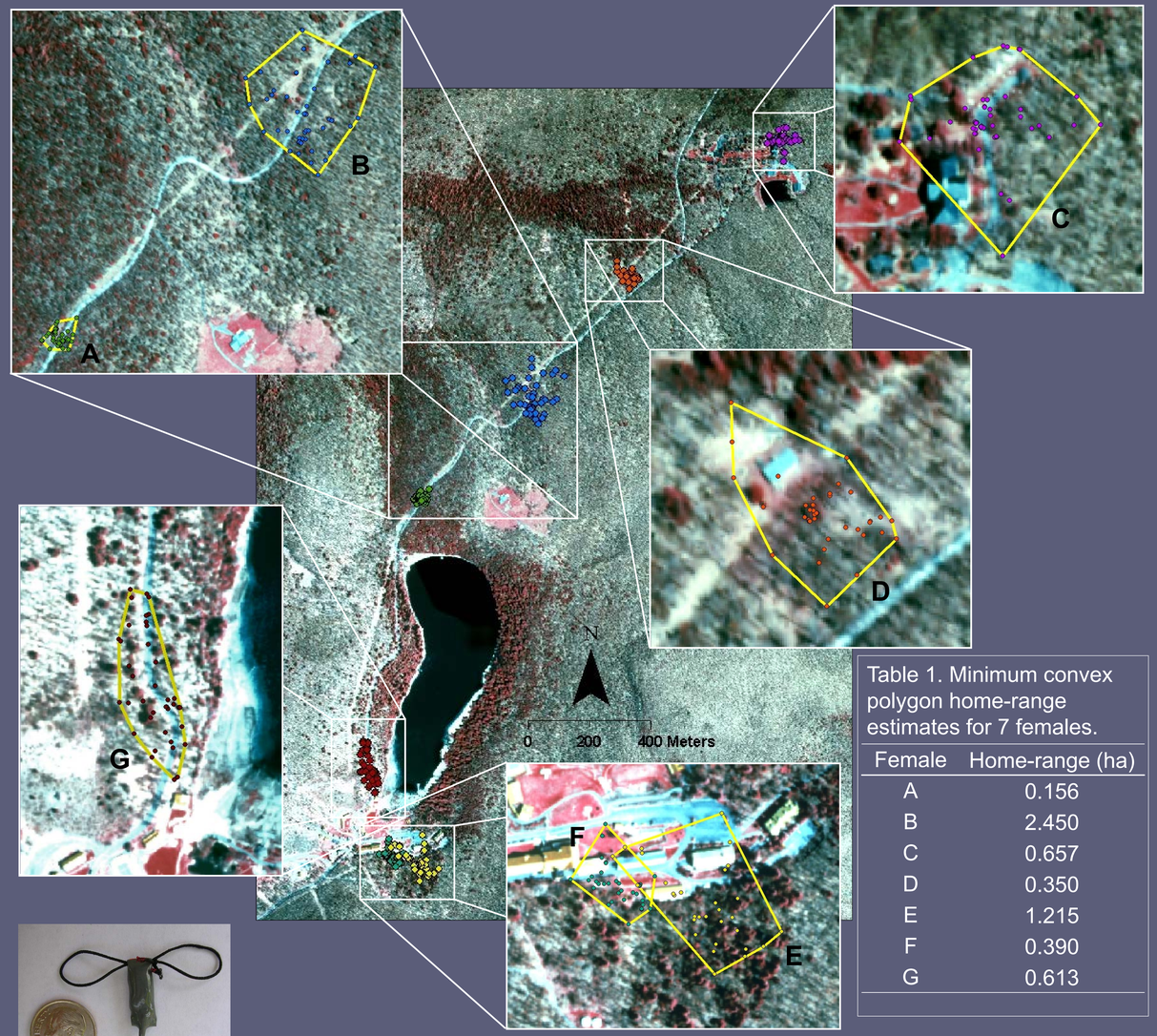
METHODS

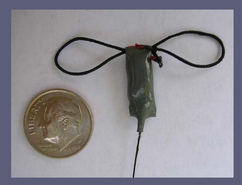
-Radio transmitters attached to 7 females using a leg-loop harness when nestlings were 3 days old.
-Females tracked using radio-telemetry 10 hours/day between days 3 and 6 of nestling life.
-Female location and behavior noted every 10 minutes.
-Location points collected using GPS.
-Home-ranges calculated as minimum convex polygons in ArcGIS 9 with Hawths Analysis Tools 3.26.











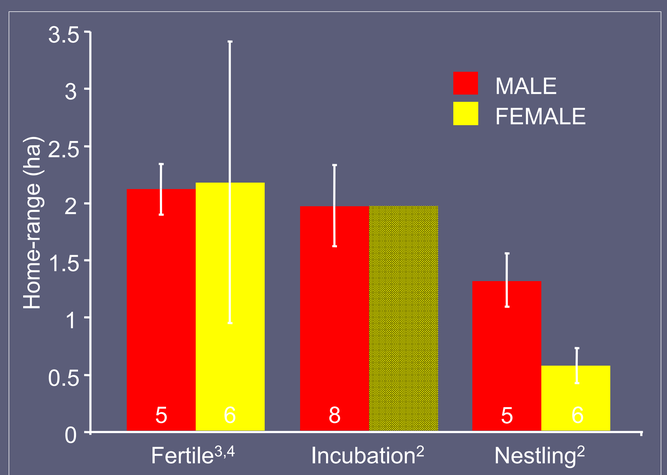


Figure 1. Comparison of home-range size by sex and stage of reproduction as determined by minimum convex polygons. No data collected on females during incubation.

Table 1. Minimum convex polygon home-range estimates for 7 females.

Female	Home-range (ha)
A	0.156
B	2.450
C	0.657
D	0.350
E	1.215
F	0.390
G	0.613

RESULTS

-Home-range size varied greatly among females (Table 1).
-Female home-range during nestling stage smaller than when fertile (Figure 1).
-Male home-range size during the nestling stage is twice that of females (Figure 1).

DISCUSSION

-As hypothesized, females maintained smaller home-ranges during the nestling period than during the fertile period.
-Need to meet energy requirements of the young may explain this decrease in home-range size.
-Females maintained smaller home-ranges than males.
-Males may limit their activity near the nest to avoid attracting predators.
-Males may also be seeking extra-pair copulations.
-Future work should focus on the relationship between territory quality (e.g. food availability) and home-range size and male activity during the nestling stage.

LITERATURE CITED

[1]Moller, A.P. 1990. Animal Behaviour. 40: 1070-1079.

[2]Chandler et al. 1994. Animal Behaviour. 47: 1445-1455.

[3]Chandler et al. 1997. Animal Behaviour. 54: 543-549.

[4]Neudorf et al. 2002. Ethology. 108: 713-726.